

Conditioned Attics Overview

Adequate attic ventilation is a long-standing requirement in building codes. However, conditioned, unvented attics have the potential to reduce residential energy needs and are allowed by code under certain conditions. Such assemblies are sometimes called cathedralized attics because, as with cathedral ceilings, the insulation is in the rafters and/or roof deck.

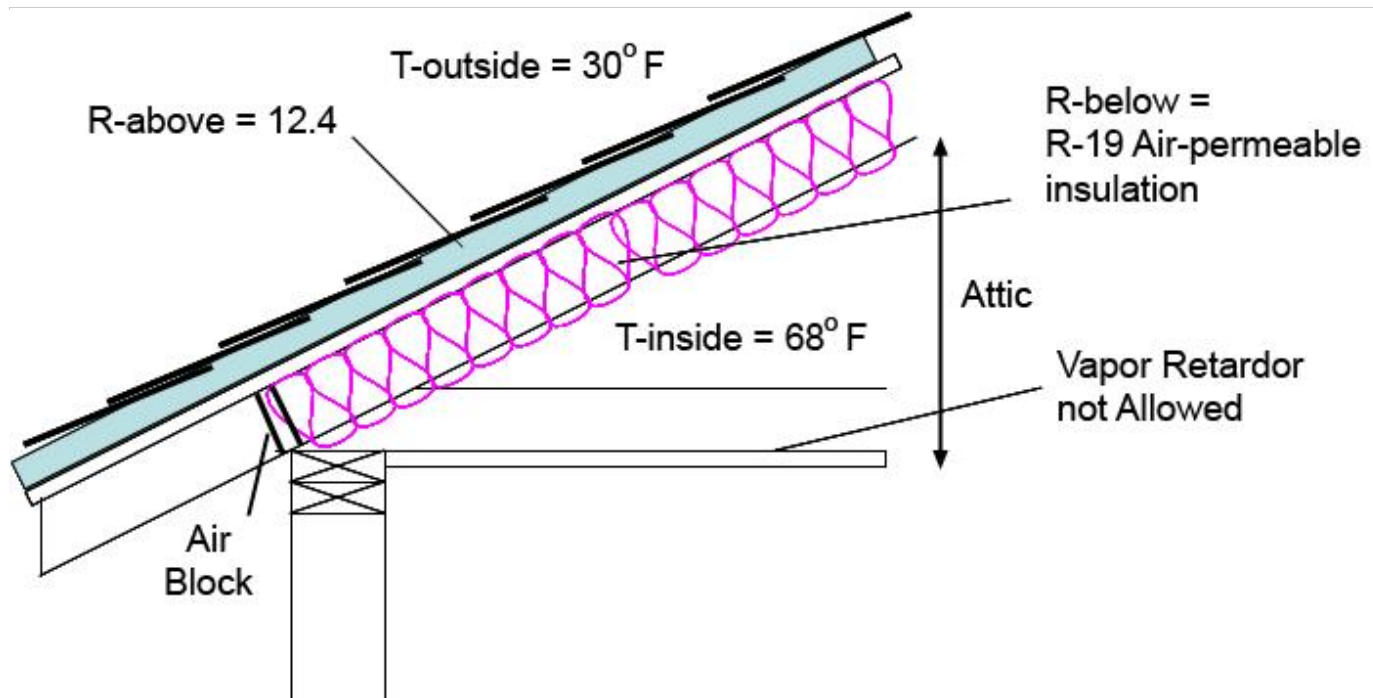
Energy Saving Construction Options

As an energy saving option, many builders construct attics without ventilation such that insulation is placed in contact with the roof sheathing instead of on the attic floor, and the attic space is air-sealed. The result is similar to a standard cathedral ceiling, except that there is an uninsulated attic floor beneath the insulated roof. This leaves a conditioned attic space in which ductwork can be located.

Because nothing prohibits cathedral style roof insulation, conditioned attics built in this manner have been indirectly allowed by the 2003 and earlier versions of the International Codes. However, the 2006 International Residential Code (IRC) now makes explicit provision for this method of construction in all climates.

The primary benefit of cathedralized attics is the ability to locate HVAC ducts inside conditioned space, where duct leaks and heat losses/gains are not detrimental to the home's energy bill. They are gaining popularity in hot, dry climates in the Southwest but may be viable in some colder climates as well, provided code-required levels of insulation can be installed underneath the roof deck. The energy savings from installing ducts in conditioned attics may be substantial; numerous studies have shown that ducts in both new and existing homes are typically very leaky.

Although ducts located in conditioned space are not required to be insulated, it is best to insulate ductwork that conveys cool air to mitigate the possibility of condensation.



Criteria for Sealed Attics

The 2006 IRC lists certain criteria for conditioned, unvented attics. For example, a vapor retarder must not exist on the attic floor, so that any moisture that may build up in the attic can dissipate into the house. The insulation must be air



impermeable and must be installed in direct contact with the interior of the structural roof deck. An exception is hot, dry climates (Climate Zones 2B and 3B) where the insulation is allowed to be air permeable.

For roof assemblies in warm humid climates in the Southeastern U.S., extra requirements apply to assist in drying of the roof deck. For asphalt roofing shingles, a vapor retarder with a perm rating of 1.0 or less is required to be installed over the roof sheathing (see Figure 1). If wood shingles or shakes are used, a ¼-inch air gap must be left above the roof sheathing but below the shingles/shakes and roofing felt.

Code Citations*

2006 IRC, Section R806.4 Conditioned attic assemblies

Unvented conditioned attic assemblies (spaces between the ceiling joists of the top story and the roof rafters) are permitted under the following conditions:

1. No interior vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly.
2. An air-impermeable insulation is applied in direct contact to the underside/interior of the structural roof deck. "Air-impermeable" shall be defined by ASTM E 283.
3. In the warm humid locations as defined in N1101.2.1:
 1. For asphalt roofing shingles: A 1 perm or less vapor retarder (determined using Procedure B of ASTM E 96) is placed to the exterior of the structural roof deck; i.e. just above the roof structural sheathing.
 2. For wood shingles and shakes: a minimum continuous ¼-inch vented air space separates the shingles/shakes and the roofing felt placed over the structural sheathing.
4. In zones 3 through 8 as defined in N1101.2 sufficient insulation is installed to maintain the monthly average temperature of the condensing surface above 45°F. The condensing surface is defined as either the structural roof deck or the interior surface of an air-impermeable insulation applied in direct contact to the underside/interior of the structural roof deck. "Air-impermeable" is quantitatively defined by ASTM E 283. For calculation purposes, an interior temperature of 68°F is assumed. The exterior temperature is assumed to be the monthly average outside temperature.

* 2006 IECC Reference and link

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International Energy Conservation Code.
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